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Rodio & Brown, Ltd.
COUNSELLORS AT LAW

February 7, 2006

By Federal Express

Mr. Morgan Turrell
Investigator in Charge
Office of Marine Safety
National Transportation Safety Board
490 L'Enfant Plaza SW
Washington, DC 20594

Re: *Dyer 40 Hull*

Dear Mr. Turrell:

As you know, we represent The Anchorage, Inc. in connection with the official investigation into the capsizing of the *Ethan Allen* on Lake George in New York State on October 2, 2005. In connection with the official investigation of the National Transportation Safety Board ("NTSB"), you and Robert Henry have asked The Anchorage for information about the hull designer, the availability of the hull mold and stability tests for sister vessels of the *Ethan Allen* f/k/a the *Double Dolphin.*

Nicholas Potter designed the hull in about 1959. We understand that Mr. Potter is deceased, but we do not know when and where. We have information that in the early 1970s, Mr. Potter had an address of 706 Santana Drive, Corona Del Mar, CA 92625 in the Newport Beach area, but do not have any more current information. The Anchorage believes that, going back 25 to 30 years, Mr. Potter's wife was in a nursing home somewhere in Oklahoma, but again we do not have better information than that. It is The Anchorage's understanding that, at least when The Anchorage dealt with Mr. Potter, he was not affiliated with a company. I am sorry we cannot be any more helpful on this point.

As for the hull mold, it is still in existence and is at The Anchorage's facility in Warren, Rhode Island. If necessary, the NTSB can have access to the mold for on-site measurements. Perhaps it is my lack of technical expertise, but it would seem to me that if measurements are necessary to develop drawings, it would make more sense to take the measurements from the actual vessel, which we understand is still available. In any event, if the NTSB needs access to the hull mold, please let me know. We would expect any measurements, drawings or other information developed from the measurements to be treated confidentially and that any documents and information would remain confidential since the information is proprietary to The Anchorage.

Finally, The Anchorage has located documents relating to simplified stability tests that were performed on a Dyer 40 hull, the M/V Huguenot II, in 1989. This hull was built as a 48 passenger launch for a yacht club. It was built with a hardtop, but the boat's configuration is not identical to the *Ethan Allen.* The launch is currently in Jamestown, Rhode Island. We have enclosed these documents for the NTSB's use. We are also enclosing a Report of EHP Test performed by M.I.T. in 1959 on Nick Potter's hull design. The report refers to a 35' power boat but we understand this to be the Dyer 40 hull. M.I.T. was apparently using LWL, rather than LOA. This was a tank test using a scale model and deals primarily with power characteristics, but you may find it useful.

As with the previous materials we provided to the NTSB, The Anchorage produces the enclosed documents subject to the protections for confidential and proprietary documents afforded by the Code of Federal Regulations and further subject to the agreement by the NTSB and its designees that they will not use any of The Anchorage's documents other than in connection with the NTSB investigation. We understand that you will send us a copy of a letter from any designees to that effect. If the NTSB or any other party or investigative authority is to have access to The Anchorage's documents, we would like to have advance notice and an opportunity to comment and/or object to the disclosure or use of the documents.

I hope this information and the enclosed documents are useful to you. Please let me know if you need anything further. If we can clarify anything or answer specific questions, please contact me.

Very truly yours,

[redacted]

Gardner H. Palmer, Jr.

GHP, Jr.
Enclosures

cc: Theodore F. Jones (w/o enc.)

U.S. Department of Transportation
United States Coast Guard

U. S. Coast Guard
Officer in Charge
Marine Inspection

John O. Pastore Fed Bldg
Providence, RI 02903-1790
(401) 528-5335

1-555-1272

16715/HUGUENOT II
23 MAY 1989

Huguenot Yacht Club
Harbor Lane
New Rochelle, NY 10805

Gentlemen:

A simplified stability test supervised by the U. S. Coast Guard was performed on the M/V HUGUENOT II, 945501, at Warren, Rhode Island on May 8, 1989 in accordance with the requirements of Title 46, Code of Federal Regulations, Section 171.030.

Test results and applicable calculations indicate that the vessel as presently outfitted and equipped has satisfactory stability for passenger service, under reasonable operating conditions, for the carriage of 48 passengers on protected waters.

Inasmuch as passenger capacity and route are based on other criteria besides stability, THE NUMBER OF PERSONS ALLOWED TO BE CARRIED AND THE ROUTE SHALL BE AS SPECIFIED ON THE CERTIFICATE OF INSPECTION.

The following restrictions shall apply:

1. Bilges shall be kept pumped to a minimum content at all times.

2. No weights are to be added, shifted or removed without prior approval of the cognizant Officer in Charge, Marine Inspection.

It shall be the responsibility of the Master of the vessel to comply with the above restrictions and maintain the vessel in a stable condition at all times.

This stability letter shall be kept on board in a suitable protective container at all times.

Sincerely,

E. J. WILLIAMS, III
Captain, U. S. Coast Guard
Officer in Charge, Marine Inspection

DEPARTMENT OF TRANSPORTATION
U. S. COAST GUARD
CG-4006 (REV. 8-79)

SMALL PASSENGER VESSEL STABILITY TEST PROCEDURE

(In accordance with 46 CFR 179.10-1)

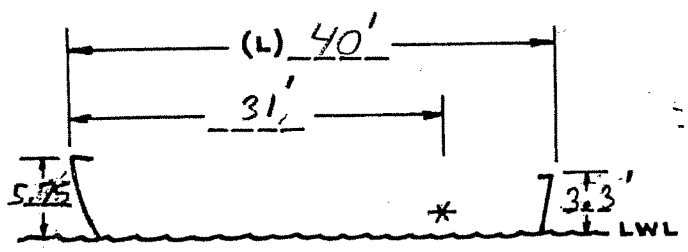
Name of Vessel HUGUENOT II Official No. ______ Date 08 MAY 89

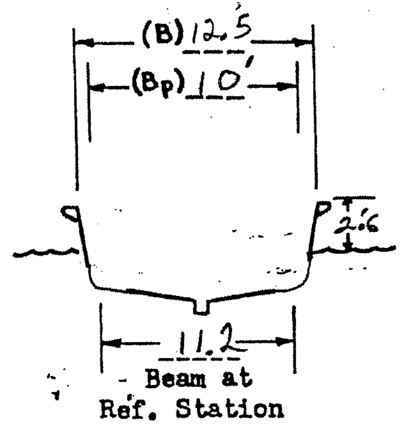
Representing Owner TOM O'BERG Inspector HALL / McCARTNEY

Location WARREN, RI Wind: Relative Direction NE Velocity 20 mph

Mooring arrangement, describe BOW INTO WIND

Route PARTIALLY PROTECTED Check One ☐ Exposed ☐ Partially Protected ☐ Protected





Indicate on above sketch

1) Profile of sheer line
2) Length over all (L)
3) Station for measuring Reference Freeboard (f)...located in way of least freeboard or at a point 3/4 (L) from the stem if the least freeboard is aft of this point
4) Freeboard to main deck at stem
5) Freeboard to main deck at stern

Indicate on above sketch

1) Round or vee bottom
2) Maximum beam to outside of shell (B)
3) Max. beam accessible to passengers (B_p)
4) Max. beam on deck in way of Freeboard Reference Station.
5) Height of sheer line above load water line in way of Freeboard Ref. Station
6) Height of each deck (including cockpit deck, if any) above load waterline.

40
23.5
16.5

All above measurements are to be taken in the loaded condition without list
If cockpit type - show same by dotted line and indicate length ( )

TANKAGE (all tanks are to be 3/4 full at the time of the test)

TANK	CAPACITY	Approx. Location of C.G.	
		Aft of Stem	Above top of keel
FUEL	95	16.5	.5'

BALLAST (if provided, ballast must be on board and in place at time of test)

WEIGHT	MATERIAL	Approx. Location of C.G.	
		Aft of Stem	Above top of keel

(1) TOTAL TEST WEIGHT REQUIRED:

48 x 160 = 7680 Lbs.
Total No. Passengers / Wt./Pass. / Total Test Weight (W)

NOTES: (A) THE MAXIMUM NUMBER OF PASSENGERS SHALL EQUAL THE MINIMUM NUMBER COMPUTED IN ACCORDANCE WITH 46 CFR 176.01-25.

(B) WEIGHT PER PASSENGER EQUALS 160 POUNDS, EXCEPT THAT ON "PROTECTED WATERS" WHEN PASSENGER LOAD CONSISTS OF MEN, WOMEN AND CHILDREN; A WEIGHT OF 140 POUNDS PER PASSENGER MAY BE USED.

(C) IF NECESSARY, SHORE OR BRACE THE DECK STRUCTURE TO PROPERLY SUPPORT THE TEST WEIGHTS.

(2) DISTRIBUTION OF TEST WEIGHT:

(a) Distribute the test weight fore and aft so as to obtain the normal operating trim.
(b) Arrange test weight so that its C.G. is approximately 2.5 feet above deck.
(c) The vertical distribution of the test weight shall be such as to simulate the most unfavorable vertical C.G. likely to occur in service. On vessels having one upper deck above the main deck available to passengers, the distribution shall not be less severe than the following —

Total Test Weight (W).................................... = 7680

Pass. Capacity of Upper Deck per 46 CFR 176.01-25 Ø (No. Pass.) x Ø (Wt./Pass.) x 1.33 = Ø Weight on Upper Deck

7680 Weight on Main Deck

(3) LOCATION OF MARK FOR MAXIMUM ALLOWABLE IMMERSION ABOVE UPRIGHT LOAD WATERLINE

(h) = .66 Ft.

The freeboard measurement (h) shall be taken with the weight required in step (1) on board, apply (a), (b) or (c) according to type of vessel -or- (d) if that gives a lesser value for the height of the mark

(a) Flush Deck Type Vessel (including well deck vessels where freeboard is measured to the weather deck) Freeboard (h) to lowest deck exposed to weather, must equal or exceed 10 inches. If less than 10 inches use 3(c), open-boat formula.

______ ÷ 2 = ______
Reference Freeboard (f) / Height of Mark (h) above L.W.L.

(b) Cockpit Type Vessels
Freeboard to cockpit deck must equal or exceed 10 inches. If less than 10 inches use 3(c), open-boat formula.

Length over all.....(L) ------------------
Length of cockpit...(l) ------------------
Ref. Freeboard......(f) ------------------
(meas'd to gunwale)
Height of Mark......(h) ------------------
above L.W.L.
As per applicable formula ------------------

On Exposed Waters

$$h = \frac{f(2L - 1.5\ell)}{4L}$$

On Protected or Partially-protected Waters

$$h = \frac{f(2L - \ell)}{4L}$$

(c) Open-Boat Type Vessels

32" ÷ 4 = 8"
Reference Freeboard (f) / Height of Mark (h) above L.W.L.

(d) For All Types of Vessels
To limit the final angle of list to 14°, as required by 46 CFR 179.10-1(g), the height of the Mark (h) shall, in no case, exceed the following —

11.2 ÷ 8 = 1.4
Beam at Ref. Station / Max. (h) for any type vessel

(4) REQUIRED HEELING MOMENT:
(Apply (a) or (b), whichever is greater

(a) Passenger Heeling Moment (M_p)

10' x 2680 ÷ 6 = 12 900 Ft.Lbs.

Maximum Beam Accessible to Pass. (B_p) — Total Test Weight (W)

(b) Wind Heeling Moment (M_w)

See sheet 4.................... 9450 Ft. Lbs.

(5) WEIGHT MOVEMENT:

THE HEELING MOMENT REQUIRED BY ITEM (4) SHALL BE OBTAINED BY A TRANSVERSE MOVEMENT OF THE TEST WEIGHTS.

(A) THE TEST SHALL BE CONDUCTED WITH ALL PORTLIGHTS SECURED BUT WITH ANY NON-RETURN VALVES OR FLAPS ON
(B) SCUPPERS OR DECK DRAINS RESTRAINED IN THE OPEN POSITION.
THE VESSEL IS TO BE FULLY AFLOAT AND ALL MOORING LINES ARE TO BE SLACK DURING THE TEST.
(C) THE VESSEL IS TO BE FULLY AFLOAT AND ALL MOORING LINES ARE TO BE SLACK DURING THE TEST.
(D) DURING LOADING AND MOVING OF TEST WEIGHTS, CARE SHOULD BE TAKEN IF THERE IS EVIDENCE OF LOW STABILITY. THIS MAY BE TAKEN TO BE THE CASE WHENEVER THE EFFECT OF ANY ADDED OR SHIFTED WEIGHT INCREMENT IS NOTED TO BE MORE THAN THAT OF A PRECEDING INCREMENT OF THE SAME SIZE, OR WHEN THE CHINE OR BILGE AMIDSHIPS COMES APPRECIABLY OUT OF THE WATER AS A RESULT OF THE HEEL.
(E) CARE IS TO BE EXERCISED THAT THE VESSEL IS NOT LISTED EXCESSIVELY EITHER DUE TO WEIGHT MOVEMENT OR SUPERIMPOSED ROLL WHICH COULD CAUSE THE TEST WEIGHTS TO TOPPLE OR SHIP'S GEAR TO COME ADRIFT.
(F) WHILE THE VESSEL IS LISTED, CHECK FOR OPEN SEAMS, LOOSE HULL FITTINGS, ETC., WHICH ARE NOT NORMALLY IMMERSED AND WHICH COULD CAUSE FLOODING OF THE VESSEL.

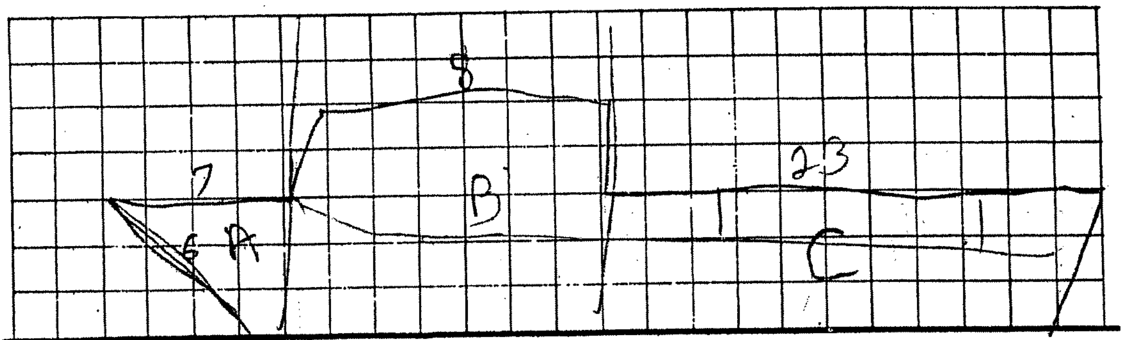
QUANTITY	WEIGHT PER UNIT-LBS.	DISTANCE MOVED-FT.	MOMENT - FT. LBS.
3	540	8'	12,960 FT LBS
		TOTAL HEELING MOMENT	12,960

(6) HEIGHT OF REFERENCE MARK ABOVE WATERLINE AFTER WEIGHT MOVEMENT:

Height of Mark (h) Above Waterline = 1.0 Ft.

(a) If the vessel lists to the reference mark (h) before the full heeling moment is applied, the test shall be stopped and the vessel fails the test.
(b) If any portlights are found to be at or near the waterline at the final angle of list, such portlights on each side shall be permanently closed.
(c) If any scuppers or drains are found to be below the waterline at the final angle of list so as to permit the entry of water into the hull or onto the deck, such openings on each side shall be provided with automatic non-return valves.

WIND HEEL CALCULATION
(Refer to Item 4b)



Load Water Line

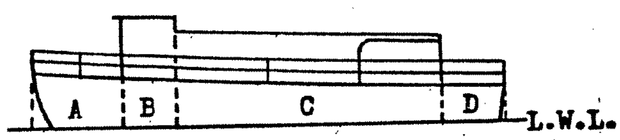
-PROFILE-
(SKETCH PROFILE IN ACCORDANCE WITH INSTRUCTIONS BELOW)

SECTION	L	V	A (L x V)	H (½ V)	A x H
A	7'	6'	42	3	126
B	8	8'	64	4	256
C	23	7	161	3.5	563.5
				Sum (A x H)	945.5

Wind Heel (M_W): 945.5 (Sum (A x H)) x 10 (P) = 9450 Ft. Lbs.

INSTRUCTIONS

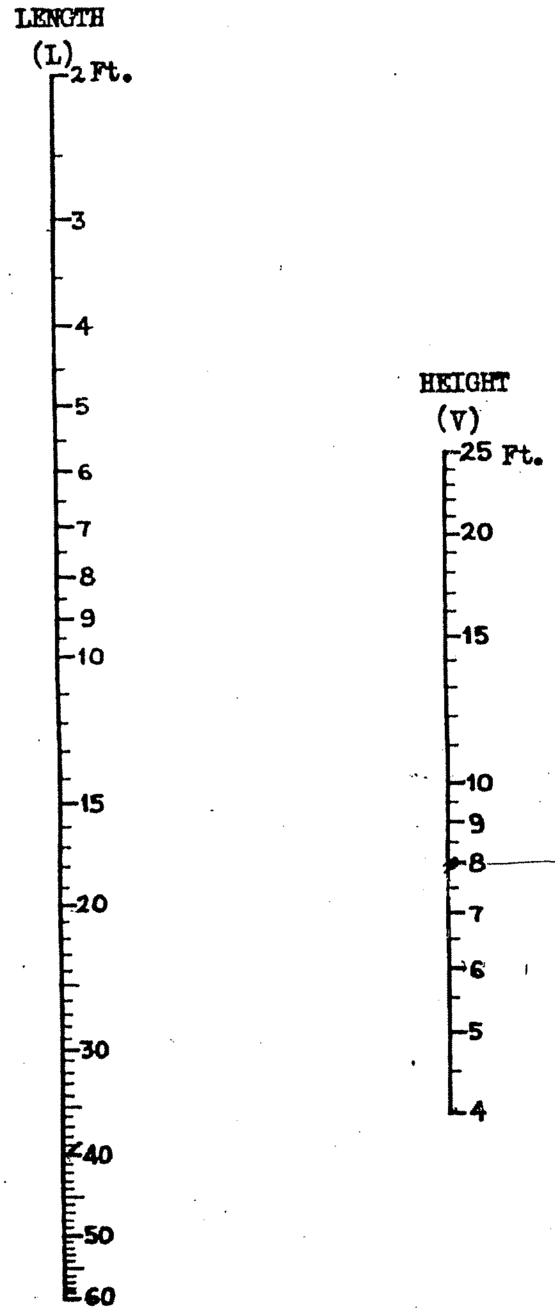
(1) Block off the profile of the vessel into rectangles, as shown below. Include passenger railings and structural canopies.

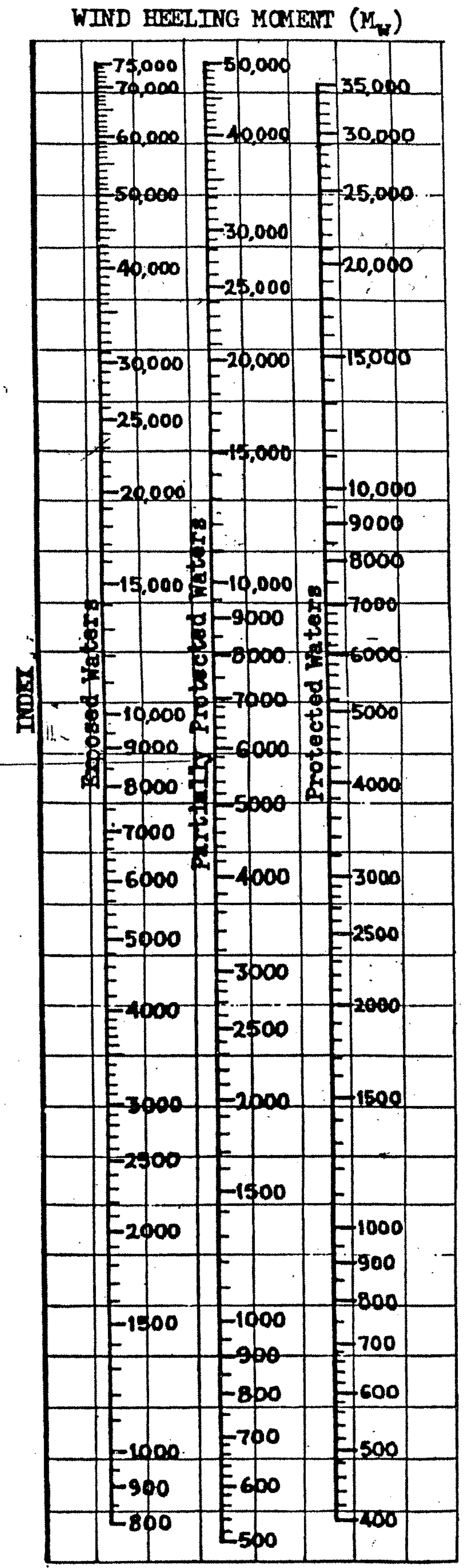


Values of "p"	
Exposed Waters	15.0
Partially Protected Waters	10.0
Protected Waters	7.5

(2) Measure, on the vessel, the length (L) and the height (V) of each rectangle and enter in Table.

(3) Complete the Table as indicated, add the products in the last column and multiply this sum by the appropriate "p" value to obtain the Wind Heeling Moment (M_W). Check results on sheet 5.





INSTRUCTIONS

(1) For each rectangular section of profile shown on sheet 4, draw a line from value on L scale through value on V scale to intersect INDEX.

(2) From this point draw a line at right angles to INDEX to intersect appropriate M_W scale to read wind heeling moment for that section.

(3) Total Wind Heeling Moment is the sum of moments for each section.

DEPARTMENT OF TRANSPORTATION
U. S. COAST GUARD
CG-4006 (REV. 8-79)

SMALL PASSENGER VESSEL STABILITY TEST PROCEDURE

(In accordance with 46 CFR 179.10-1)

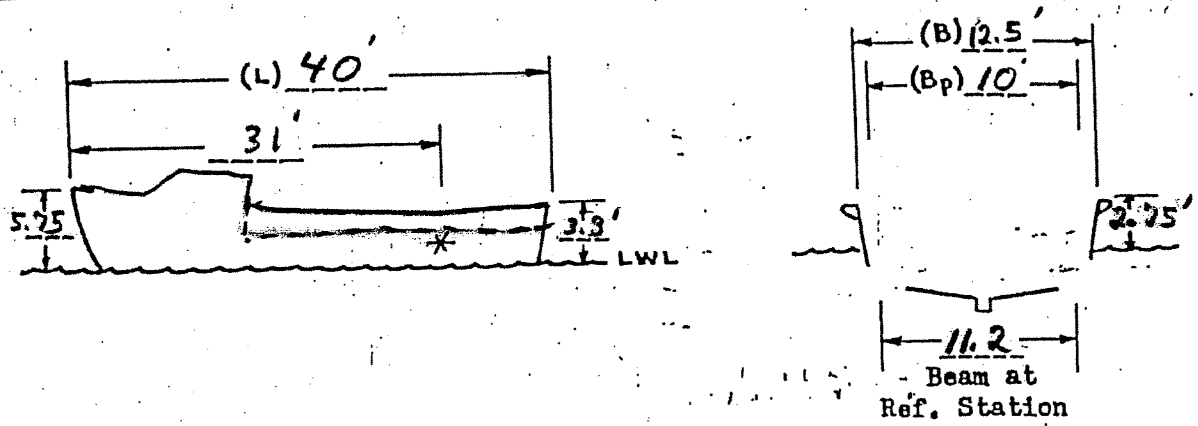
Name of Vessel HUGUENOT II Official No. ________ Date Ø8 MAY 89

Representing Owner TOM O'BERG (OYER BOATS) Inspector HALL / McCARTNEY

Location OYER BOATS, WARREN, RI Wind: Relative Direction NE Velocity 20 mph

Mooring arrangement, describe MOORED PORT SIDE, WIND OFF STBD BOW

Route LONG ISLAND SOUND 1,000' Check One ☐ Exposed ☐ Partially Protected ☒ Protected



Indicate on above sketch

1) Profile of sheer line
2) Length over all (L)
3) Station for measuring Reference Freeboard (f)...located in way of least freeboard or at a point 3/4 (L) from the stem if the least freeboard is aft of this point
4) Freeboard to main deck at stem
5) Freeboard to main deck at stern

Indicate on above sketch

1) Round or vee bottom
2) Maximum beam to outside of shell (B)
3) Max. beam accessible to passengers (B_p)
4) Max. beam on deck in way of Freeboard Reference Station.
5) Height of sheer line above load water line in way of Freeboard Ref. Station
6) Height of each deck (including cockpit deck, if any) above load waterline.

All above measurements are to be taken in the loaded condition without list
If cockpit type - show same by dotted line and indicate length ( )

TANKAGE (all tanks are to be 3/4 full at the time of the test)

TANK	CAPACITY	Approx. Location of C.G.	
		Aft of Stem	Above top of keel
FUEL	95 GAL	16.5'	.5'

BALLAST (if provided, ballast must be on board and in place at time of test)

WEIGHT	MATERIAL	Approx. Location of C.G.	
		Aft of Stem	Above top of keel
NONE			

(1) TOTAL TEST WEIGHT REQUIRED:

48 x 140 = 6720 Lbs.

Total No. Passengers — Wt./Pass. — Total Test Weight (W)

NOTES: (A) THE MAXIMUM NUMBER OF PASSENGERS SHALL EQUAL THE MINIMUM NUMBER COMPUTED IN ACCORDANCE WITH 46 CFR 176.01-25.

(B) WEIGHT PER PASSENGER EQUALS 160 POUNDS, EXCEPT THAT ON "PROTECTED WATERS" WHEN PASSENGER LOAD CONSISTS OF MEN, WOMEN AND CHILDREN; A WEIGHT OF 140 POUNDS PER PASSENGER MAY BE USED.

(C) IF NECESSARY, SHORE OR BRACE THE DECK STRUCTURE TO PROPERLY SUPPORT THE TEST WEIGHTS.

(2) DISTRIBUTION OF TEST WEIGHT:

(a) Distribute the test weight fore and aft so as to obtain the normal operating trim.
(b) Arrange test weight so that its C.G. is approximately 2.5 feet above deck.
(c) The vertical distribution of the test weight shall be such as to simulate the most unfavorable vertical C.G. likely to occur in service. On vessels having one upper deck above the main deck available to passengers, the distribution shall not be less severe than the following —

Total Test Weight (W)................................... = 6720

Pass. Capacity of Upper Deck per 46 CFR 176.01-25 Ø (No. Pass.) x ______ (Wt./Pass.) x 1.33 = 0 Weight on Upper Deck

______ Weight on Main Deck

(3) LOCATION OF MARK FOR MAXIMUM ALLOWABLE IMMERSION ABOVE UPRIGHT LOAD WATERLINE

(h) = .69 Ft.

The freeboard measurement (h) shall be taken with the weight required in step (1) on board, apply (a), (b) or (c) according to type of vessel -or- (d) if that gives a lesser value for the height of the mark.

(a) Flush Deck Type Vessel (including well deck vessels where freeboard is measured to the weather deck)
Freeboard (h) to lowest deck exposed to weather, must equal or exceed 10 inches. If less than 10 inches use 3(c), open-boat formula.

______ ÷ 2 = ______

Reference Freeboard (f) — Height of Mark (h) above L.W.L.

(b) Cockpit Type Vessels
Freeboard to cockpit deck must equal or exceed 10 inches. If less than 10 inches use 3(c), open-boat formula.

Length over all.....(L) ----------
Length of cockpit...(l) ----------
Ref. Freeboard......(f) ----------
(meas'd to gunwale)
Height of Mark......(h) ----------
above L.W.L.
As per applicable formula ----------

On Exposed Waters

$$h = \frac{f(2L - 1.5\ell)}{4L}$$

On Protected or Partially-protected Waters

$$h = \frac{f(2L - \ell)}{4L}$$

(c) Open-Boat Type Vessels

2.75′ ÷ 4 = .69′

Reference Freeboard (f) — Height of Mark (h) above L.W.L.

(d) For All Types of Vessels
To limit the final angle of list to 14°, as required by 46 CFR 179.10-1(g), the height of the Mark (h) shall, in no case, exceed the following —

11.2 ÷ 8 = 1.4′

Beam at Ref. Station — Max. (h) for any type vessel

(4) REQUIRED HEELING MOMENT:
(Apply (a) or (b), whichever is greater

(a) Passenger Heeling Moment (M_p)

10 (Maximum Beam Accessible to Pass. (B_p)) x 6720 (Total Test Weight (W)) ÷ 6 = 11,200 Ft.Lbs.

(b) Wind Heeling Moment (M_w)

See sheet 4.......................... 7091.25 Ft. Lbs.

(5) WEIGHT MOVEMENT:

(A) THE HEELING MOMENT REQUIRED BY ITEM (4) SHALL BE OBTAINED BY A TRANSVERSE MOVEMENT OF THE TEST WEIGHTS.

(B) THE TEST SHALL BE CONDUCTED WITH ALL PORTLIGHTS SECURED BUT WITH ANY NON-RETURN VALVES OR FLAPS ON SCUPPERS OR DECK DRAINS RESTRAINED IN THE OPEN POSITION.

(C) THE VESSEL IS TO BE FULLY AFLOAT AND ALL MOORING LINES ARE TO BE SLACK DURING THE TEST.

(D) DURING LOADING AND MOVING OF TEST WEIGHTS, CARE SHOULD BE TAKEN IF THERE IS EVIDENCE OF LOW STABILITY. THIS MAY BE TAKEN TO BE THE CASE WHENEVER THE EFFECT OF ANY ADDED OR SHIFTED WEIGHT INCREMENT IS NOTED TO BE MORE THAN THAT OF A PRECEDING INCREMENT OF THE SAME SIZE, OR WHEN THE CHINE OR BILGE AMIDSHIPS COMES APPRECIABLY OUT OF THE WATER AS A RESULT OF THE HEEL.

(E) CARE IS TO BE EXERCISED THAT THE VESSEL IS NOT LISTED EXCESSIVELY EITHER DUE TO WEIGHT MOVEMENT OR SUPERIMPOSED ROLL WHICH COULD CAUSE THE TEST WEIGHTS TO TOPPLE OR SHIP'S GEAR TO COME ADRIFT.

(F) WHILE THE VESSEL IS LISTED, CHECK FOR OPEN SEAMS, LOOSE HULL FITTINGS, ETC., WHICH ARE NOT NORMALLY IMMERSED AND WHICH COULD CAUSE FLOODING OF THE VESSEL.

QUANTITY	WEIGHT PER UNIT-LBS.	DISTANCE MOVED-FT.	MOMENT - FT. LBS.
2.75	540	8	11,880
		TOTAL HEELING MOMENT	11,880

(6) HEIGHT OF REFERENCE MARK ABOVE WATERLINE AFTER WEIGHT MOVEMENT:

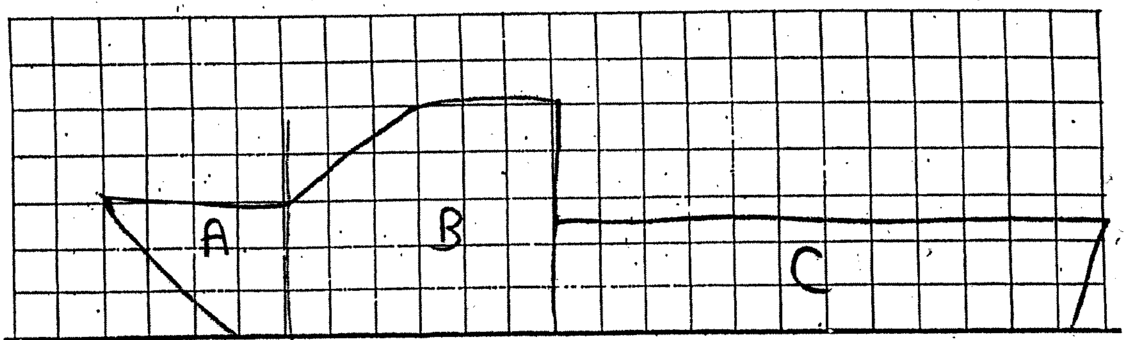
Height of Mark (h) Above Waterline = .5 Ft.

(a) If the vessel lists to the reference mark (h) before the full heeling moment is applied, the test shall be stopped and the vessel fails the test.

(b) If any portlights are found to be at or near the waterline at the final angle of list, such portlights on each side shall be permanently closed.

(c) If any scuppers or drains are found to be below the waterline at the final angle of list so as to permit the entry of water into the hull or onto the deck, such openings on each side shall be provided with automatic non-return valves.

WIND HEEL CALCULATION
(Refer to Item 4b)



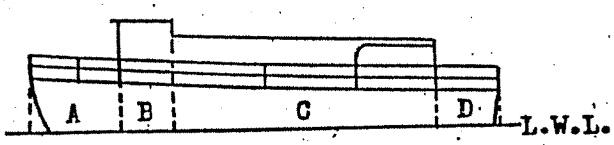
-PROFILE-
(SKETCH PROFILE IN ACCORDANCE WITH INSTRUCTIONS BELOW)

SECTION	L	V	A (L x V)	H (½ V)	A x H
A	7'	6'	42	3	126
B	8	8	64	4	256
C	23	7	161	3.5	563.5
				Sum (A x H)	945.5

Wind Heel (M_W): $\underset{\text{Sum (A x H)}}{945.5} \times \underset{P}{7.5} = 7091.25$ Ft. Lbs.

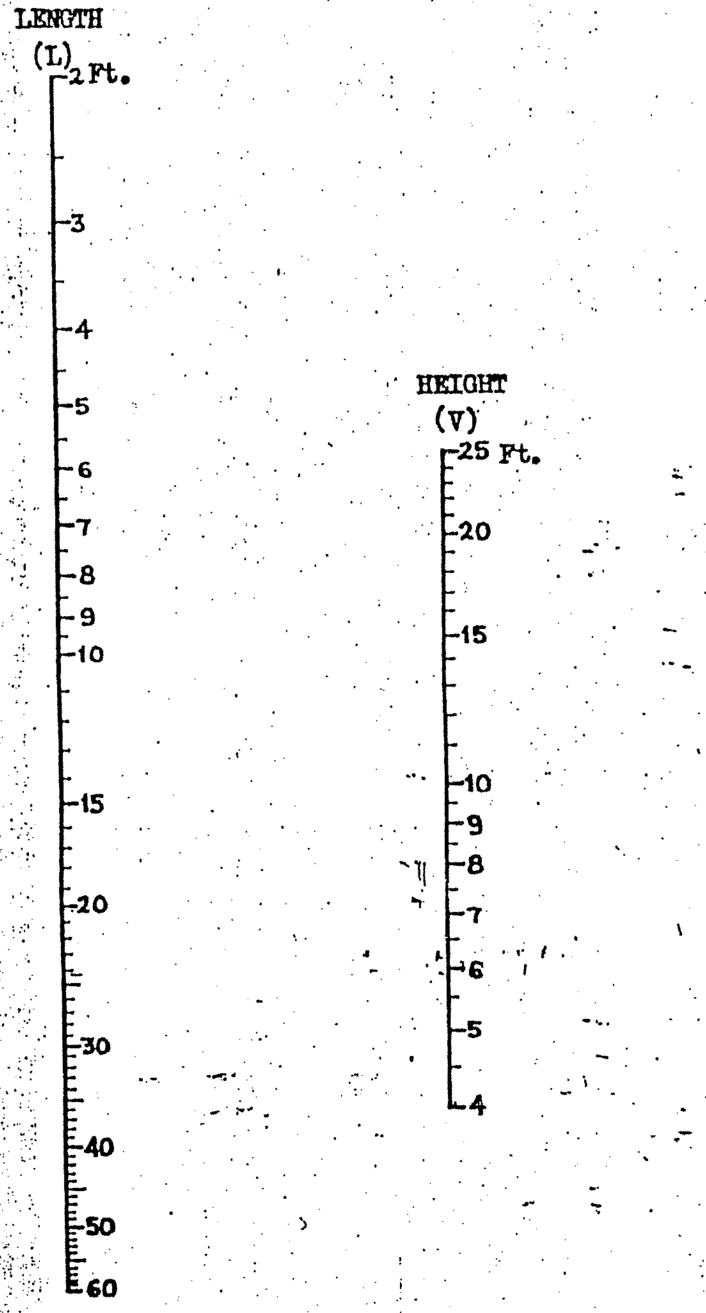
INSTRUCTIONS

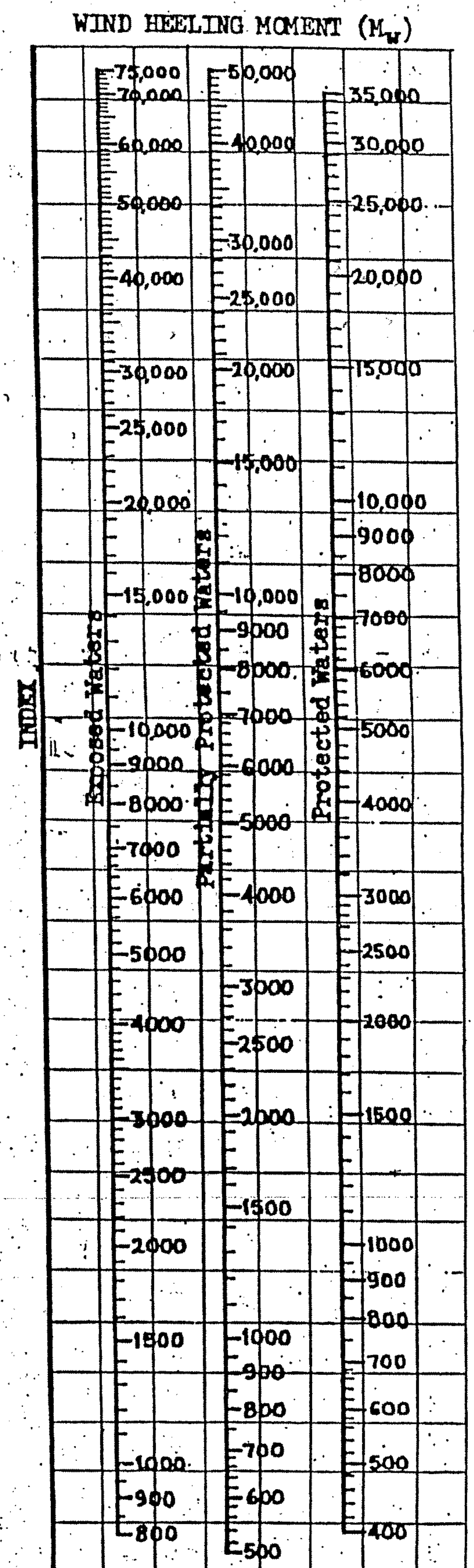
(1) Block off the profile of the vessel into rectangles, as shown below. Include passenger railings and structural canopies.



(2) Measure, on the vessel, the length (L) and the height (V) of each rectangle and enter in Table.
(3) Complete the Table as indicated, add the products in the last column and multiply this sum by the appropriate "P" value to obtain the Wind Heeling Moment (M_W). Check results on sheet 5.

Values of "P"	
Exposed Waters	15.0
Partially Protected Waters	10.0
Protected Waters	7.5





INSTRUCTIONS

(1) For each rectangular section of profile shown on sheet 4, draw a line from value on L scale through value on V scale to intersect INDEX.

(2) From this point draw a line at right angles to INDEX to intersect appropriate M_W scale to read wind heeling moment for that section.

(3) Total Wind Heeling Moment is the sum of moments for each section.

M. I. T. SHIP MODEL TOWING TANK

Report of EHP Test
35-Foot Power Boat
for
Nicholas S. Potter

November 18, 1959

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Naval Architecture and Marine Engineering

Ship Model Towing Tank

REPORT OF EHP TEST

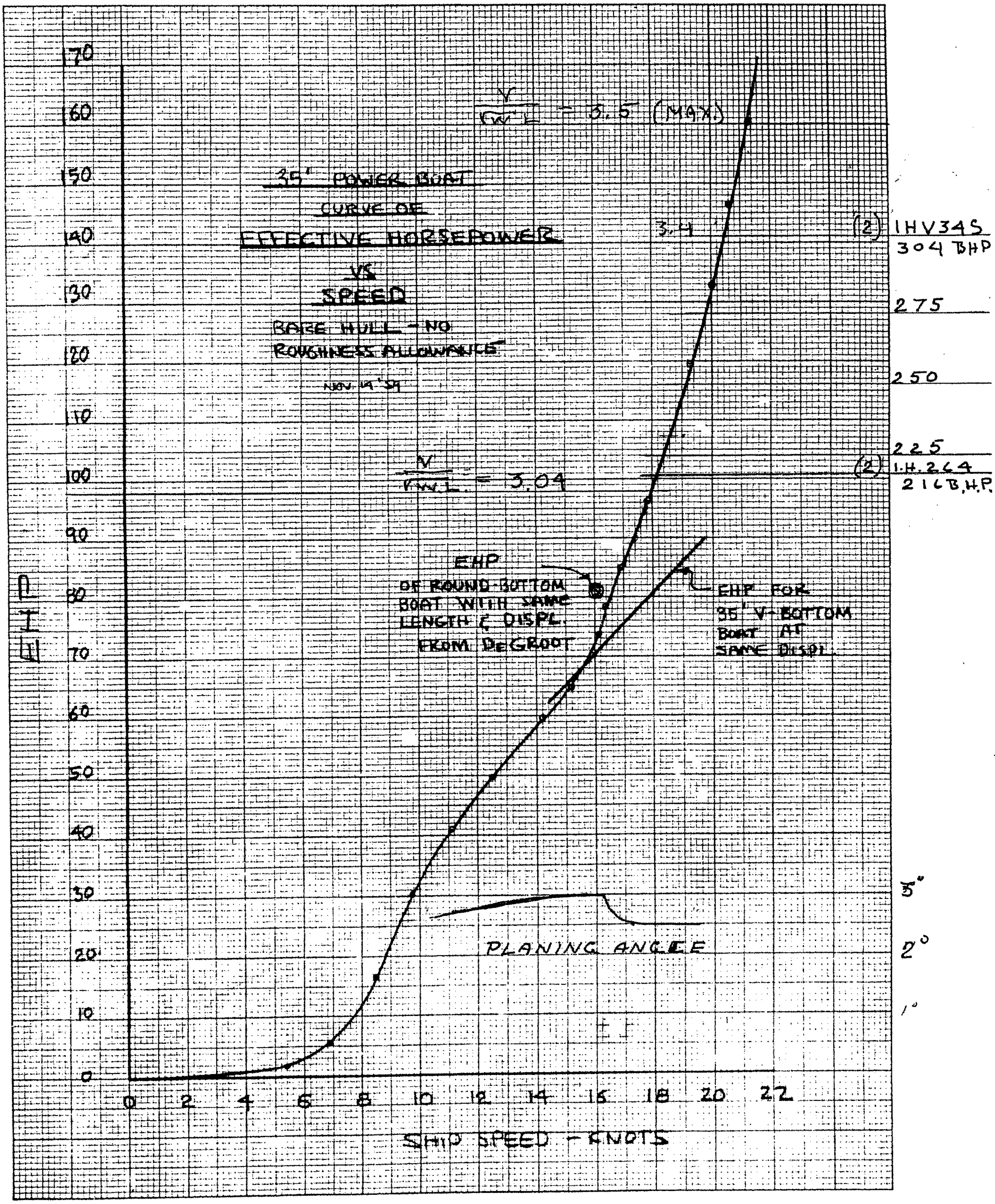
35-FOOT POWER BOAT

for

Nicholas S. Potter

Providence, Rhode Island

November 18, 1959


35' POWER BOAT
CURVE OF
EFFECTIVE HORSEPOWER
VS
SPEED
BARE HULL - NO ROUGHNESS ALLOWANCE
NOV. 19 '59
V/√WL = 3.5 (MAX)
3.4
V/√WL = 3.04
EHP OF ROUND-BOTTOM BOAT WITH SAME LENGTH & DISPL. FROM DeGROOT
EHP FOR 35' V-BOTTOM BOAT AT SAME DISPL.
PLANING ANGLE
(2) 1HV345 304 BHP
275
250
225
(2) 1.H.264 216 B.H.P.
3°
2°
1°
EHP
SHIP SPEED - KNOTS
0 2 4 6 8 10 12 14 16 18 20 22
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170

SIMPLIFIED FORMULA

B.H.P. to E.H.P. (for this particular model)

Take off 80% of Max. R.P.M.

Find B.H.P. from Power Curve.

Multiply this H.P. by the factor .465

to find a very close approx. value of E.H.P.

EXAMPLE:

Using Palmer IH-264

Max. R.P.M. 3400

3400 R.P.M. x 80% = 2720 R.P.M. = 108 B.H.P.

108 B.H.P. x .465 = 50.22 E.H.P.

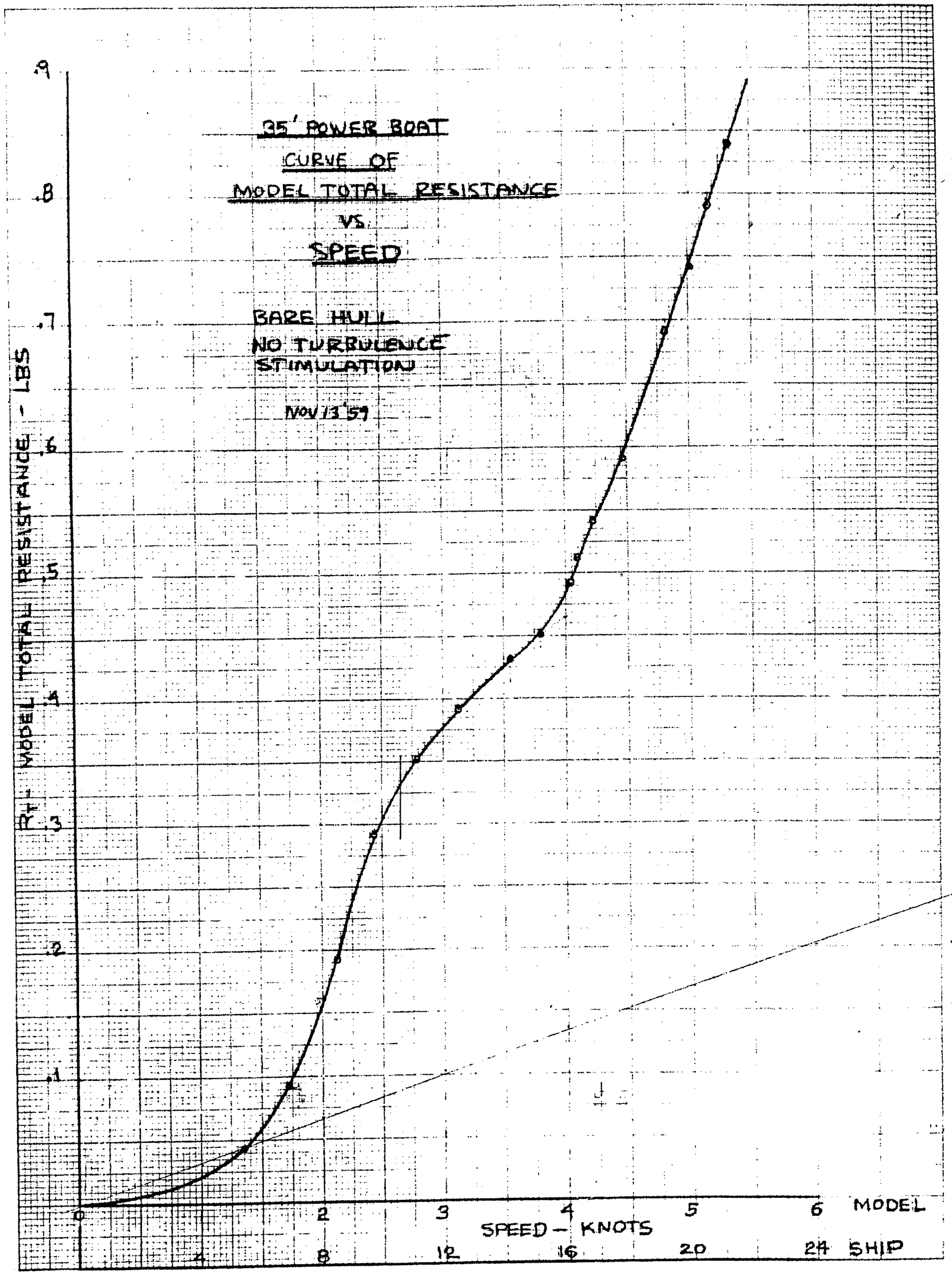
Refer to E.H.P. Graph 50 E.H.P. = 12.3 KN

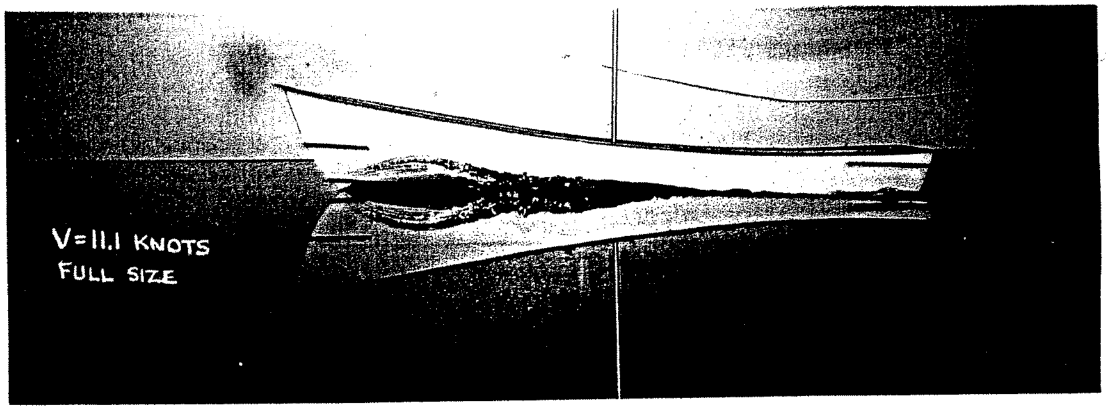
E.H.P. + B.H.P. =

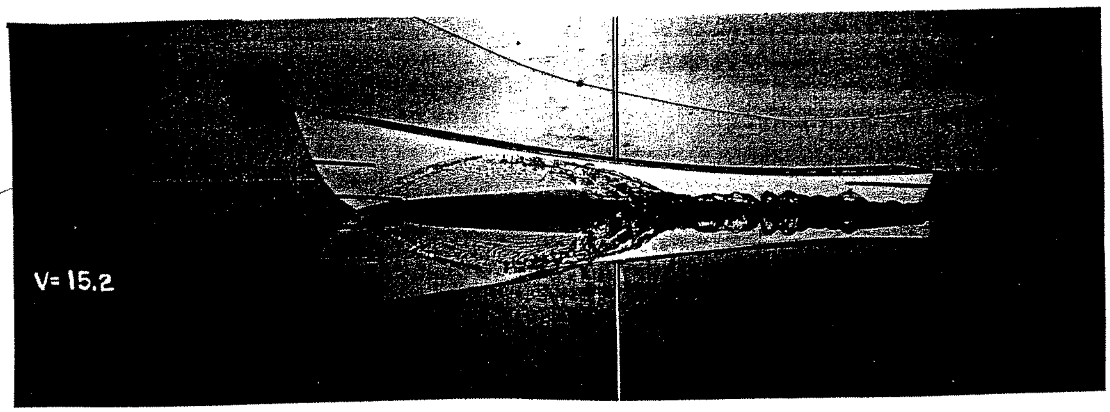
$$\frac{\text{E.H.P.}}{.465} = \text{B.H.P.}$$

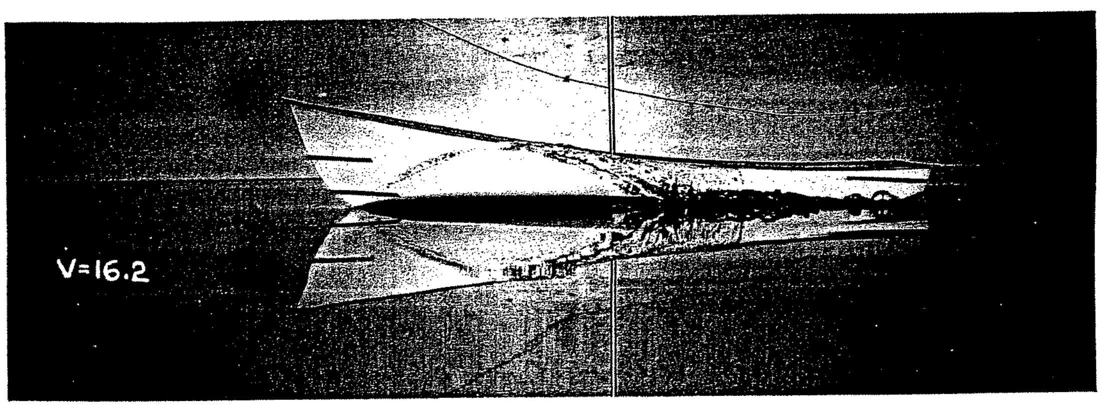
EXAMPLE:

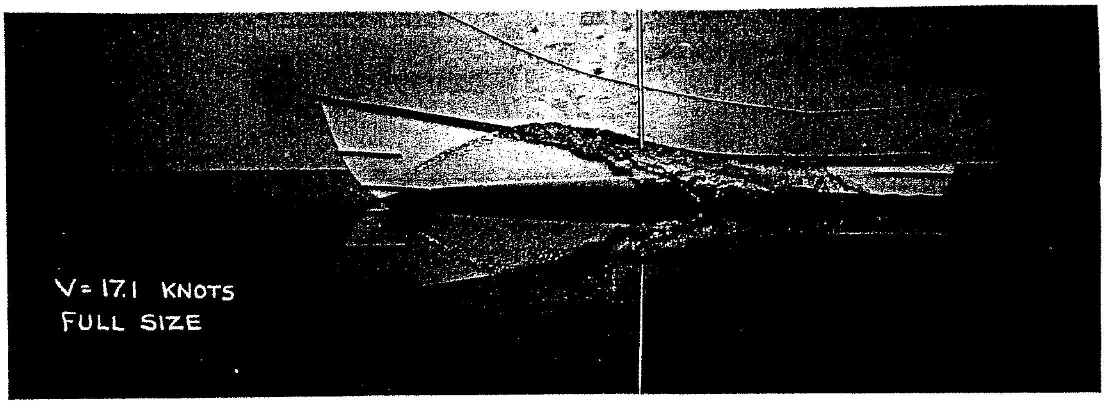
$$\text{E.H.P.} = \frac{50.22}{.465} = 108 \text{ B.H.P.}$$

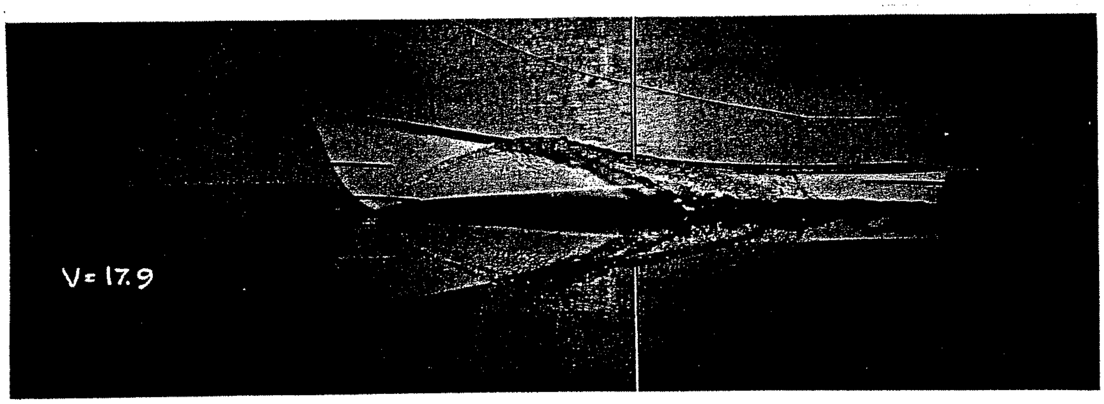

35' POWER BOAT
CURVE OF
MODEL TOTAL RESISTANCE
VS
SPEED
BARE HULL
NO TURBULENCE
STIMULATION
NOV 13 '59
R_T - MODEL TOTAL RESISTANCE - LBS
.9
.8
.7
.6
.5
.4
.3
.2
.1
0
2
3
4
5
6
MODEL
SPEED - KNOTS
4
8
12
16
20
24
SHIP

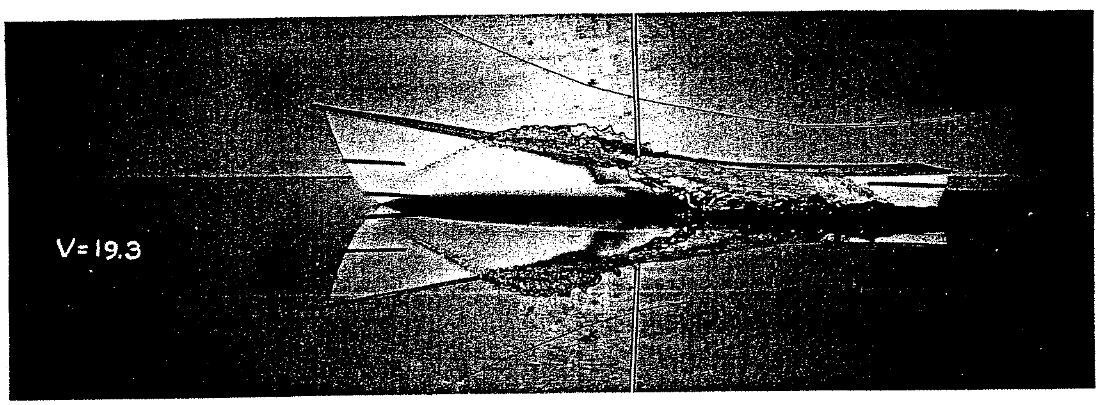

V=11.1 KNOTS
FULL SIZE


V= 15.2


V=16.2


V= 17.1 KNOTS
FULL SIZE


V= 17.9


V= 19.3

MIT SHIP MODEL TOWING TANK

MODEL RESISTANCE TEST DATA AND CALCULATION SHEET

MODEL NO. C_p = .630 C_B = .403 SHIP ______ TEST NO. ______ PROJECT NO. 35' POWER BOAT DATE 29 OCT '59

LENGTH 2.193 FT. SCALE 16 LENGTH 35.09 FT. DATA TAKEN BY KERWIN FOR N. POTTER, PROVIDENCE R.I.

DISPLACEMENT 3.60 lbs. FW 72 °F DISPL. 15,160 TONS SW 59 °F TURBULENCE STIMULATION NONE WATER TEMP. 72 °F FW

WETTED SURFACE 1.2864 FT² WETTED SURFACE 329 FT² SAND ______ STRIP WIDTH ______ DENSITY 1.9358 SLUGS/FT³

DES. SPEED 4 KTS $V/\sqrt{L}$ 2.7008 DESIGNED SPEED 16 KTS. LOCATION ______ KIN. VISCOSITY 1.0279 $\times 10^{-5}$ FT²/SEC

APPENDAGES KEEL REMARKS ______

TEST CONDITION ______

$\frac{1}{2}\rho S v^2 = \frac{1}{2}(1.9358)(1.2864)(1.6889)^2 V^2 = (3.5504)V^2$ | $Re_{TEST} = \frac{vL}{\nu_{TEST}} = \frac{(2.193)(1.6889)V}{(1.0279)10^{-5}} = (3.6032)V \times 10^5$ | $Re_{70°} = \frac{vL}{\nu_{70°}} = \frac{(2.193)(1.6889)V}{(1.0552)10^{-5}} = (3.510)V \times 10^5$

RUN	(1) F_D APPLIED FORCE Lb	(2) V KNOTS	(3) V^2	(4) F_F PULLEY FRICTION Lb	(5) R_T (1)−(4) Lb	(6) $\frac{1}{2}\rho S v^2$ =(3.5504)V^2 ×W Lb	(7) $C_{T_{TEST}}$ (5)÷(6)	(8) Re_{TEST} =( )V ×10⁵	(9) $C_{f_{TEST}}$	(10) $Re_{70°}$ =(3.510)V ×10⁵	(11) $C_{f_{70°}}$	(12) (7)−(9)	(13) $C_{T_{70°}}$ (11)+(12)	(14) $V/\sqrt{L}$ =(.6752)V
1	0.05	1.350	1.8225	.0066	.0434	6.471	6.707 ×10⁻³	4.8644 ×10⁵	5.517 ×10⁻³	4.7385 ×10⁵	5.551 ×10⁻³	1.190 ×10⁻³	6.791 ×10⁻³	.9115
2	0.10	1.728	2.986	.0070	.0930	10.602	8.772	6.2264	5.210	6.0653	5.241	3.562	8.803	1.1667
3	0.20	2.115	4.4732	.0074	.1926	15.882	12.127	7.6208	4.977	7.4237	5.006	7.150	12.156	1.428
4	0.30	2.443	5.9682	.0077	.2923	21.190	13.794	8.8027	4.820	8.5749	4.848	8.974	13.822	1.6495
5	0.36	2.780	7.7284	.0081	.3514	27.440	12.622	10.0170	4.688	9.7578	4.712	7.934	12.646	1.877
6	0.40	3.128	9.7844	.0084	.3916	35.784	10.944	11.2709	4.568	10.9793	4.593	6.376	10.969	2.112
7	0.44	3.550	12.6025	.0088	.4312	47.205	9.135	12.7915	4.446	12.4605	4.472	4.689	9.161	2.397
8	0.46	3.800	14.440	.0090	.4510	55.118	8.183	13.6923	4.383	13.3380	4.404	3.800	8.204	2.566
9	0.50	4.040	16.3216	.0092	.4908	63.743	7.700	14.5570	4.328	14.1804	4.357	3.372	7.723	2.728
10	0.52	4.080	16.6464	.0093	.5107	65.307	7.820	14.7012	4.319	14.3208	4.343	3.501	7.844	2.755
11	0.55	4.228	17.876	.0094	.5406	71.400	7.571	15.2345	4.286	14.8403	4.310	3.285	7.595	2.855
12	0.60	4.466	19.9452	.0096	.5904	83.205	7.100	16.0920	4.238	15.6757	4.262	2.862	7.124	3.015
13	0.70	4.817	23.2035	.0098	.6902	102.154	6.756	17.3568	4.173	16.9077	4.196	2.583	6.779	3.252
14	0.75	5.007	25.070	.0099	.7401	111.706	6.625	18.0414	4.140	17.5746	4.160	[illegible]	6.645	3.381
15	0.80	5.157	26.5946	.0100	.7900	119.443	6.614	18.5819	4.115	18.1011	4.137	2.499	6.636	3.482
16	0.85	5.342	28.5370	.0101	.8399	129.187	6.474	19.2485	4.086	18.7505	4.107	2.390	6.497	3.607

CALCULATION SHEET FOR EHP TEST

MODEL NO. ____ C_B ____ SHIP ____ TEST NO. ____ PROJECT NO. N. Potter DATE 19 Nov '59

LENGTH 2.193 FT. SCALE ____ LENGTH 35.09 FT. DONE BY ____ FOR ____

DISPL. 3.60 Lbs. FW 72 °F DISPL. 15,160 LBS ~~TONS~~ S.W. 59°F STIMULATION NONE

WETTED SURFACE 1.286 FT² WETTED SURFACE 329 (at 0 speed) FT² TEST CONDITIONS Model has molded in skeg - no other appendages

DES. SPEED 4 KTS. V/√L ____ DESIGNED SPEED 16 KTS. REMARKS ____

$(\Delta C_f)_M$ 0 $\times 10^{-3}$ $(\Delta C_f)_S$ 0 $\times 10^{-3}$

$V_{S\_T\_W}$ =( )$\times 10^{-5}$ FT²/SEC $Re_{SHIP} = \frac{v_s L_s}{\nu_s} = \frac{(35.09)(1.6889)V}{(1.2817)\times 10^{-5}} = (4.6238\ V_s \times 10^{+6})$

RUN	MODEL ① V_M	② C_T	③ Re =( )V_M ×10⁸	④ $C_f+(\Delta C_f)_M$	⑤ C_r ②-④	⑥ $\frac{V}{\sqrt{L}}$ =( )V_M	SHIP ⑦ V_s =( )V_M =( )⑥	⑧ V_s^3	⑨ Re =(4.6238)V ×10⁺⁶	⑩ $C_f+(\Delta C_f)_S$	⑪ C_T ⑤+⑩	⑫ $\frac{\frac{1}{2}\rho S v_s^3}{550}$ =(.002868)V_s^3 ×10³	⑬ EHP ⑪×⑫	
1		×10⁻³	×10⁸	×10⁻³	×10⁻³	WETTED SURF. FACTOR 1.00	5.900	157.46	2.497 ×10⁺⁷	2.574 ×10⁻³	3.764 ×10⁻³	.451 ×10³	1.70	
2						1.000	6.912	330.23	3.196	2.475	6.037	.947	5.72	
3						1.000	8.460	605.50	3.912	2.398	9.548	1.736	16.58	
4						1.000	9.772	933.15	4.518	2.345	11.319	2.676	30.29	
5						1.015	11.120	1374.5	5.142	2.300	10.234	4.001	40.95	
6					Form 1	1.030	12.512	1958.8	5.785	2.259	8.635	5.786	49.96	
7	Form 4	Form 1	Form 1	Form 1		1.055	14.200	2863.3	6.566	2.216	6.905	8.664	59.82	
8					(12)	1.075	15.200	3511.8	7.028	2.199	5.994	10.826	64.89	
9	(2)	(13)	(10)	(11)	See	1.100	16.160	4220.1	7.472	2.174	5.546	13.314	73.84	
10	See	See	See	See		1.105	16.320	4346.7	7.546	2.171	5.672	13.775	78.13	
11						1.125	16.912	4837.1	7.820	2.160	5.445	15.607	84.98	
12						1.175	17.864	5700.8	8.260	2.192	5.004	19.211	96.13	
13						1.240	19.268	7153.4	8.909	2.119	4.702	25.439	119.6	
14						1.255	20.028	8033.7	9.261	2.107	4.592	28.915	132.8	
15						1.265	20.628	8777.5	9.538	2.098	4.597	31.893	146.4	
16						1.280	21.368	9756.4	9.880	2.087	4.477	35.815	160.3	

WETTED SURFACE CALC.

SM	STATION	ft d(half-Girth)	$\Delta d\%$	ft d_f	f(A)	2 f(A)
1	0	0	0	0	0	0
4	1	2.05	15.4	2.37	9.48	18.96
2	2	3.29	14.3	3.76	7.52	15.04
4	3	4.37	9.85	4.80	19.20	38.4
2	4	5.04	5.99	5.34	10.68	21.36
4	5	5.62	1.71	5.72	22.88	45.76
2	6	5.97	1.71	6.07	12.14	24.28
4	7	6.17	0.00	6.17	24.68	49.36
2	8	5.69	0.86	5.74	11.48	22.96
4	9	4.65	1.71	4.73	18.92	37.84
1	10	4.08	0.86	4.12	4.12	8.24
Σ	$\Sigma f(A)$				141.10	282.20

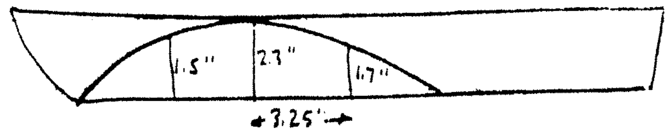
$$S_w = 2f(A) \times \frac{S}{3} = 282.20 \times 1.167$$

$$\boxed{S_w = 329.33 \ ft^2}$$

$S = 3.5\ ft$ $\qquad S/3 = 1.167\ ft$

Extra Wetted Surface

16 KNOTS

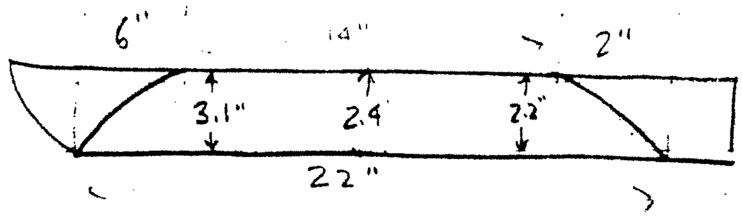


$$A_{model} = \frac{2 \times 3.25}{3}\left(4 \times 1.5 + 2 \times 2.3 + 4 \times 1.7\right) = 37.7 \text{ in}^2$$

$\lambda = 16$

$$A_{SHIP} = \frac{37.7 \times 256}{144} = 67 \text{ ft}^2 \quad \text{both sides.}$$

19.3 KNOTS.



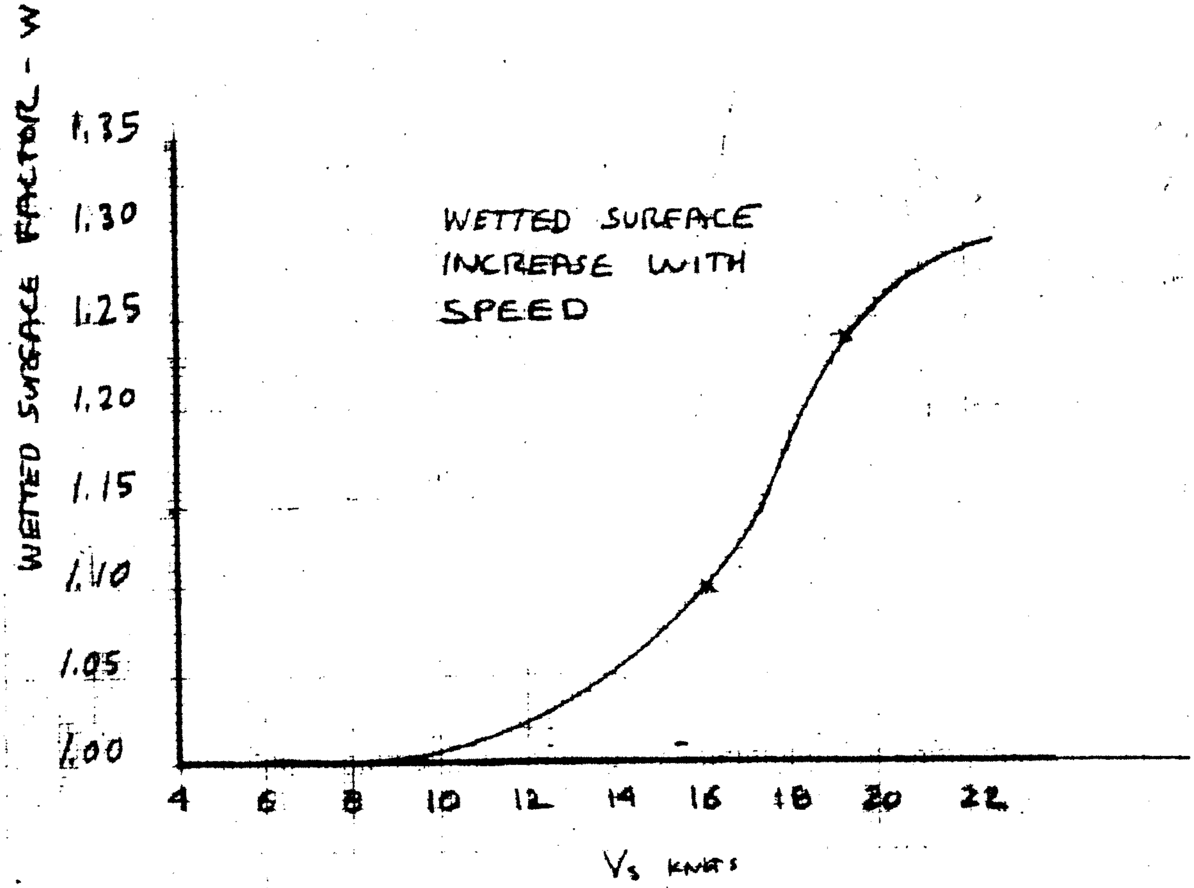
$$A_{model} = 2\left(\frac{3.1 \times 6}{2} + \frac{2.2 \times 2}{2} + 14 \times 2.4\right)$$

$$= 2\left(9.3 + 2.2 + 33.6\right) = 90 \text{ in}^2$$

$$A_{ship} = \frac{90 \times 256}{144} = 160 \text{ ft}^2$$

Assume added WS 50% effective.

at	54 knots	added WS	= 0	WS =	329 ft^2	1.00
at	16.16 "	"	33 ft^2	" =	362 ft^2	1.1
at	19.3 "	"	80	" =	409 ft^2	1.24



W = WETTED SURFACE FACTOR = $\frac{\text{WETTED SURFACE UNDER WAY}}{\text{WETTED SURFACE AT } V=0}$

JSK 14 NOV

- Check on EHP calculation -

$= 6.823$ ft/sec

$V = 4.040 \quad R_T = .4908$

$WS = 329 \times 1.1 = 362 \ ft^2 \quad = \frac{362}{256} = 1.414 \ ft^2$

$t = 72° \quad \rho = 1.9358 \quad \nu = 1.0279 \times 10^{-5}$

$\frac{1}{2}\rho(WS)V^2 = \frac{1}{2} \times 1.9358 \times 1.414 \times 6.8238^2 = 63.725$

$C_T = \frac{.4908}{63.725} = 7.702 \times 10^{-3}$

$R_e = \frac{VL}{\nu} = \frac{6.823 \times 2.193}{1.0279} \times 10^5 = 1.456 \times 10^6$

$C_f = 4.329 \times 10^{-3} \qquad C_R = 3.373$

Full Size salt water

$T = 59° \quad \rho = 1.9905 \quad \nu = 1.2817 \times 10^{-5}$

$V = 16.16$ knots $= 27.29$ ft/sec $\quad V^2 = 744.7$

$R_e = \frac{27.29 \times 35.09 \times 10^5}{1.2817} = 7.471 \times 10^7$

$C_f = 2.174 \times 10^{-3}$

$C_T = 5.547 \times 10^{-3}$

$R_T = 5.547 \times 10^{-3} \times \frac{1}{2} \times 1.9905 \times 362 \times 744.7 = 1480$ lbs.

$EHP = \frac{R_T \cdot V}{550} = \frac{1480 \times 27.29}{550} = \boxed{73.4}$

Comparison of Potter Boat with other forms. I Planing V-bottom
II De Groot Round-Bottom

P-boat characteristics

$L = 35.09'$ (on w.l.) $\Delta = 15160\#$ (s.w.)

$B = 10.00'$ (on w.l.) $L/B = 3.51$

$H \cong 1.83'$ (fairbody) $\Delta/(L/10)^3 = \frac{237}{43.1} = 5.50$

DESIGN SPEED $V = 16$ knots

I Comparison with a V-bottom planing form that has low resistance for this speed range. Reference B.S. Thesis, Webb Institute of Naval Architecture, Title - Analyzing the Stepless Planing Hull.

MODEL V-2

$L = 2.00'$ (w.l.) $\nabla = (5.50)(.2)^3 = .440\ FT^3$ $L/B = 3.50$

$B = 6.86''$ $\Delta = .440 \times 322 \times 1.933 = 2.74\#$

SCALE RATIO $\lambda = \frac{35.09}{2.00} = 17.545$ $\lambda^3 = 308$ $\sqrt{\lambda} = 4.19$

Comparison carried out at 16, 18 & 19 knots for the full size boat. Model test was carried out at 2.89# displacement. Resistance is assumed to vary linearly with displacement at the same speed for this ~5.5% change in displacement.

Model speeds $V_1 = 3.82 \times 1.689 = 6.45$ ft/sec $R_{T1} = .370\#$

$V_2 = 4.30 \times 1.689 = 7.26$ ft/sec $R_{T2} = .392\#$

$V_3 = 4.54 \times 1.689 = 7.66$ ft/sec $R_{T3} = .405\#$

wetted surface $S_1 = 1.03\ ft^2$ average wetted length $l_1 = 1.762\ ft$

$S_2 = .95\ ft^2$ $l_2 = 1.638\ ft$

$S_3 = .90\ ft^2$ $l_3 = 1.572\ ft$

ITTC line 1957

Reynolds no. $Re_{m1} = \frac{6.45 \times 1.762}{.923 \times 10^{-5}} = 1.23 \times 10^6$ $C_{f1} = 4.48 \times 10^{-3}$

$Re_{m2} = \frac{7.26 \times 1.638}{.923 \times 10^{-5}} = 1.29 \times 10^6$ $C_{f2} = 4.44 \times 10^{-3}$

$Re_{m3} = \frac{7.66 \times 1.572}{.923 \times 10^{-5}} = 1.31 \times 10^6$ $C_{f3} = 4.42 \times 10^{-3}$

Resistance correction for model displacement

$C_{T1} = .370 / \tfrac{1}{2}\ 1.933\ 1.03\ (6.45)^2 = .370/41.4 \times 2.74/2.89 = 8.47 \times 10^{-3}$

$C_{T2} = .392 / \tfrac{1}{2}\ 1.933\ .95\ (7.26)^2 = .392/48.4 \times 2.74/2.89 = 7.67 \times 10^{-3}$

$C_{T3} = .405 / \tfrac{1}{2}\ 1.933\ .90\ (7.66)^2 = .405/51.0 \times 2.74/2.89 = 7.44 \times 10^{-3}$

$C_{R1} = C_{R1S} = 3.99 \times 10^{-3}$ $Re_{s1} = \frac{16 \times 1.689 \times 1.762 \times 17.545}{1.28 \times 10^{-5}} = 16 \times 40.7 \times 10^5 = 6.52 \times 10^7$

$C_{R2S} = 3.23 \times 10^{-3}$ $Re_{s2} = 7.34 \times 10^7$

$C_{R3S} = 3.02 \times 10^{-3}$ $Re_{s3} = 7.75 \times 10^7$

$C_{fs1} = 2.22 \times 10^{-3}$ $C_{TS1} = 6.21 \times 10^{-3}$ $S_1 = 318\ ft^2$ $v_1^3 = 19680$

$C_{fs2} = 2.18 \times 10^{-3}$ $C_{TS2} = 5.41 \times 10^{-3}$ $S_2 = 292\ ft^2$ $v_2^3 = 28090$

$C_{fs3} = 2.16 \times 10^{-3}$ $C_{TS3} = 5.18 \times 10^{-3}$ $S_3 = 277\ ft^2$ $v_3^3 = 33080$

1. $\tfrac{1}{2}\rho S v^3 / 550 = 11310$

2. $= 14820$

3. $= 16600$

$EHP_1 = (6.21)(11.31) = 70.3\ hp$ $V_{S1} = 16\ kn$

$EHP_2 = (5.41)(14.82) = 80.1\ hp$ $V_{S2} = 18\ kn$

$EHP_3 = (5.18)(16.60) = 86.0\ hp$ $V_{S2} = 19\ kn$

II Comparison with De Groot Contours Fig 8.

Reference: Resistance and Propulsion of Motor-Boats

Comparison made for $V_S = 16$ kn $\quad V/\sqrt{L} = 2.70 \quad \Delta/(L/10)^3 = 5.50$

$R_{Tm} = 7.5$ kg $= 16.5$ # $\qquad V_m = (2.70)(7.39)^{1/2} = 7.35$ kn

$L_m = 2.25$ m $= 7.39$ ft $\qquad \nabla = (5.50)(.739)^3 = 2.22$ ft^3

wetted surface $S_m = 2.75\sqrt{\nabla L} = 2.75\sqrt{16.4} = 11.13$ ft^2

$$C_{Tm} = \frac{R_T}{1/2 \rho S v^2} = \frac{16.5}{1/2(1.938)(11.13)(7.35 \times 1.689)^2} = \frac{16.5}{1658} = 9.96 \times 10^{-3}$$

$$Re_m = \frac{v_m L_m}{\nu_m} = \frac{(7.35)(1.689)(7.39)}{1.21 \times 10^{-5}} = 7.57 \times 10^6 \qquad C_f = 3.15 \times 10^{-3}$$

ITTC line 1957

ν_m 60°F assumed

$C_{Rm} = C_{Rs} = 6.81 \times 10^{-3}$

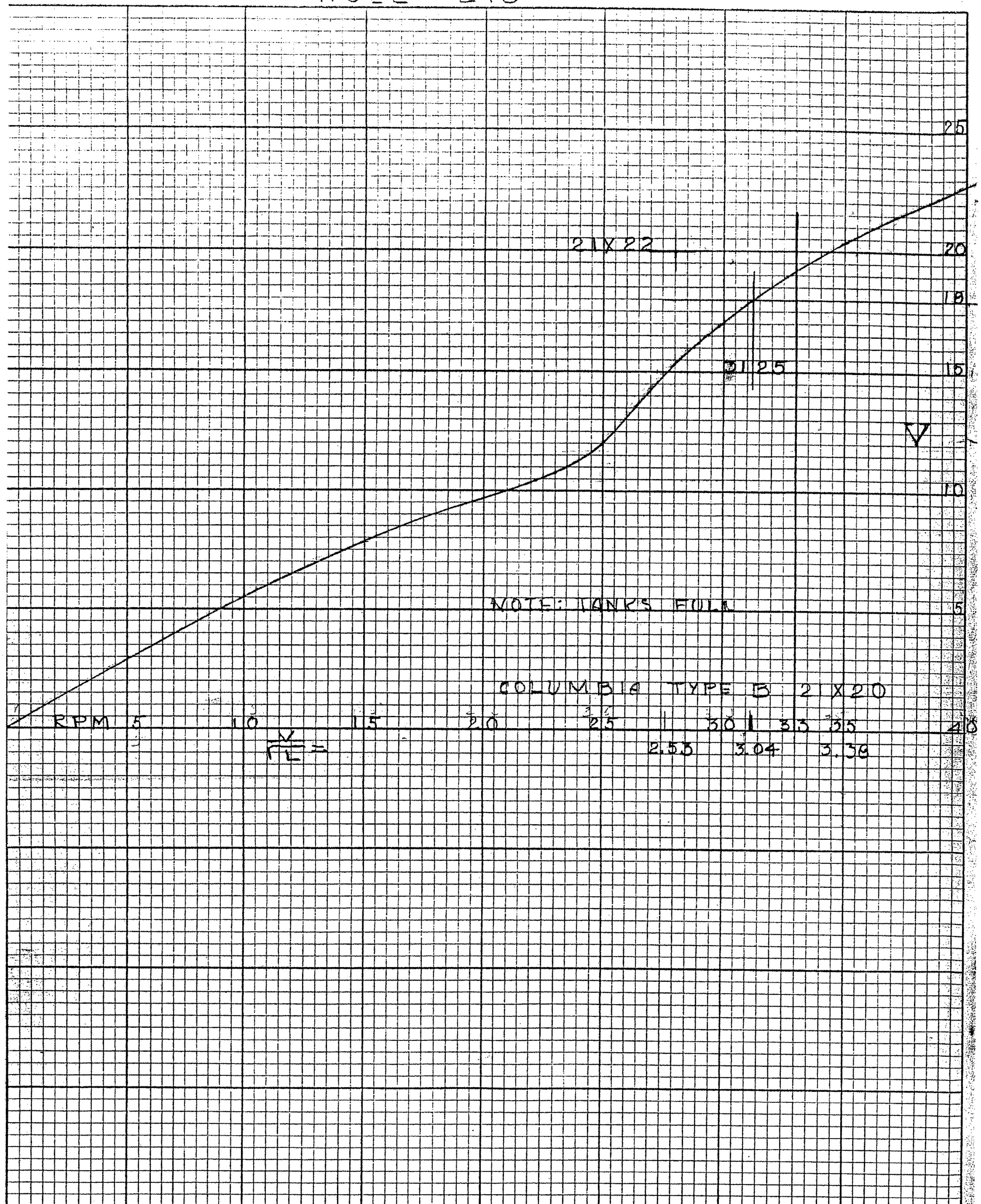
$$Re_s = \frac{v_s L_s}{\nu_s} = \frac{(16.0)(1.689)(35.09)}{1.28 \times 10^{-5}} = 7.4 \times 10^7 \qquad C_{fs} = 2.18 \times 10^{-3}$$

$$C_{Ts} = 8.99 \times 10^{-3} \qquad \frac{1/2 \rho S v^3}{550} = \frac{1/2(1.99)(252)(19680)}{550} = 8960$$

$$S_s = (11.13)\left(\frac{35.09}{7.39}\right)^2 = 252 \text{ ft}^2$$

$$\boxed{EHP = (8.99)(8.96) = 80.5 \text{ @ } V_s = 16 \text{ knots}}$$

HULL #218



21X22
21 25
V
NOTE: TANKS FULL
COLUMBIA TYPE 5 21X20
RPM 5 10 15 20 25 30 33 35 40
2.53 3.04 3.39
25
20
18
15
10
5

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DEPARTMENT OF NAVAL ARCHITECTURE
AND MARINE ENGINEERING
CAMBRIDGE 39, MASS.

17 June 1960

Mr. W. J. H. Dyer, President
ANCHORAGE PLASTICS CORPORATION
57 Miller Street
Warren, Rhode Island

RECEIVED JUN 20 1960

Dear Mr. Dyer:

In reply to your letter of 3 June 1960, the model of the 35-foot power boat for Nicholas S. Potter may be picked up at any time in Room 5-319.

We do not recall that any specific agreement was reached concerning seakeeping tests of this model during the spring term. At the time a series of planing hulls were being tested, and it was remarked that someone might like to compare the seakeeping characteristics of your boat with these. However, no one has expressed an interest in doing this up to now.

I am enclosing a few results of the thesis, "The Effects of a Loading Factor Upon the Speed of Planing Hulls in Waves" by Charles Garland which you might find interesting. Model SC-1 was used in our calm water comparison of a planing hull with Mr. Potter's design. The other planing hulls tested showed very similar trends in speed loss in waves but with somewhat greater losses in speed.

If you could let me know when someone is coming for the model, I will make arrangements to have someone here at that time. I can be reached at UNiversity 4-6900, extension 134 or 131.

Yours truly,

[redacted]

Justin E. Kerwin

JEK:mml
encs.
cc: M. A. Abkowitz

$E =$ Dimensionless EHP =

$$E = \frac{R_T \cdot v}{(\rho g)\sqrt{g}\ \nabla^{7/6}}$$

v = velocity in ft/sec

R_T = resistance in lbs.

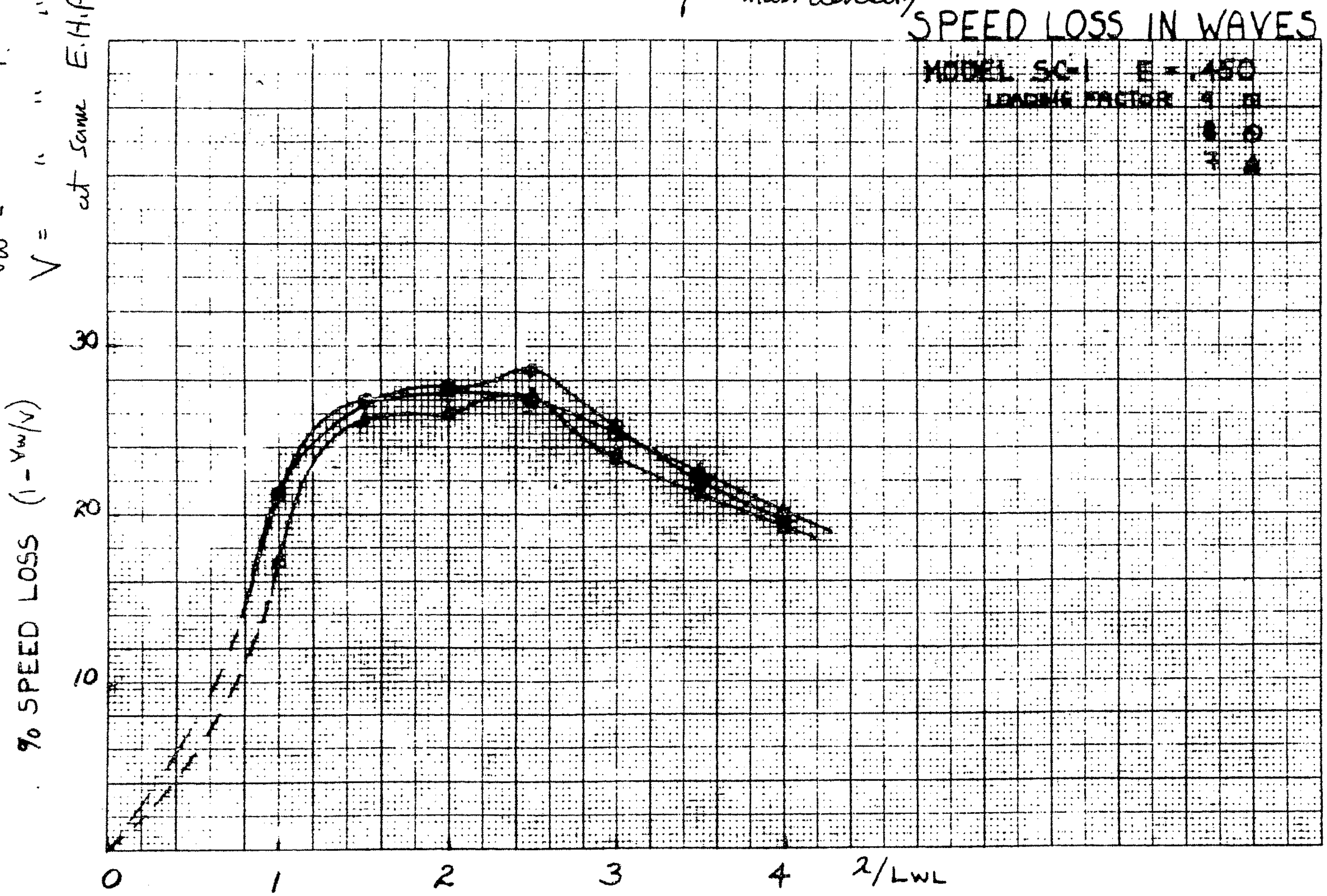
g = accell of gravity (32.2)

ρ = mass density

V_W = model speed in waves

V = " " " still water

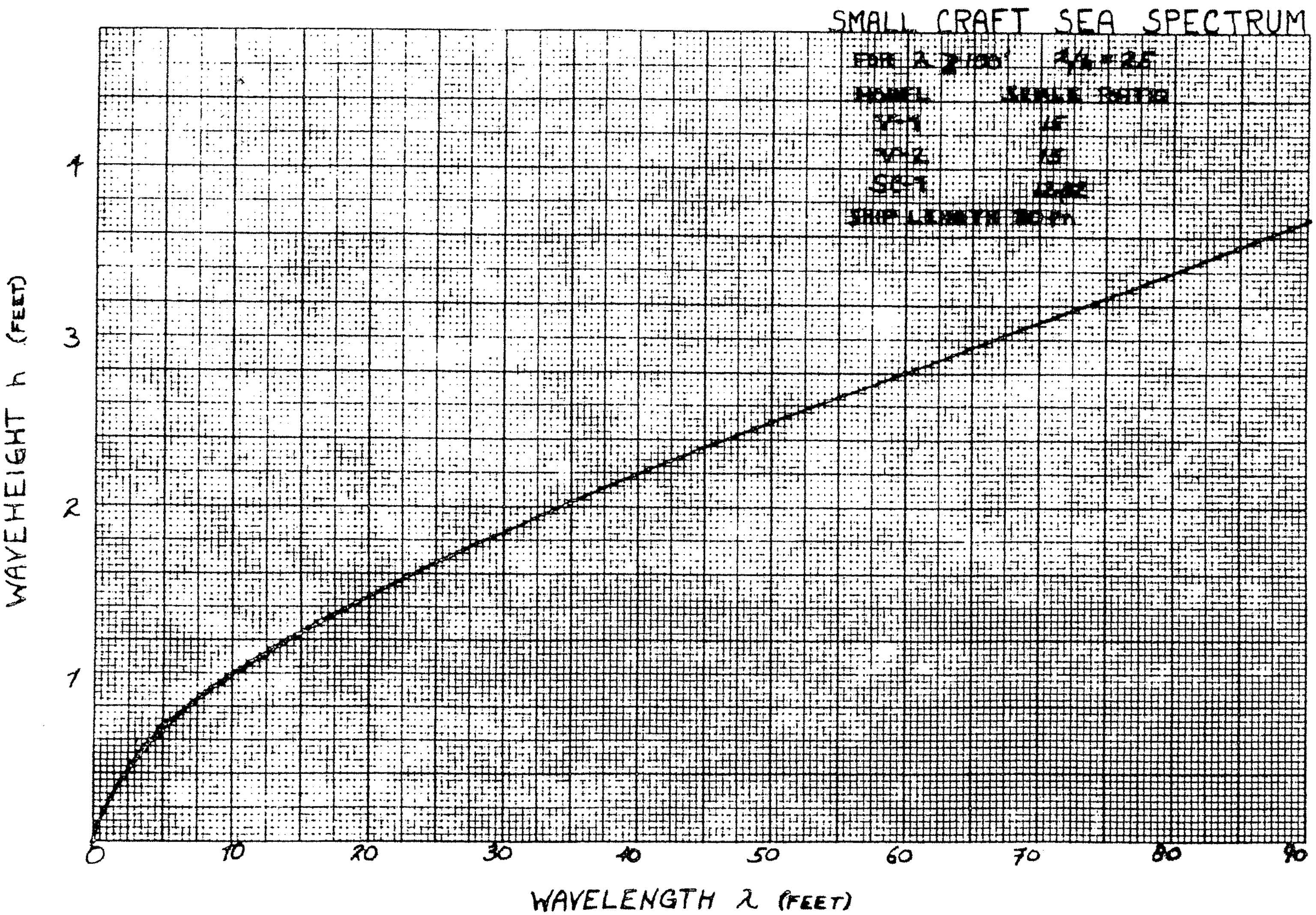
at same E.H.P.



λ = wave length

L = model length waterline

FIG. III


SMALL CRAFT SEA SPECTRUM
V-1
V-2
WAVEHEIGHT h (FEET)
1
2
3
4
WAVELENGTH λ (FEET)
0
10
20
30
40
50
60
70
80
90

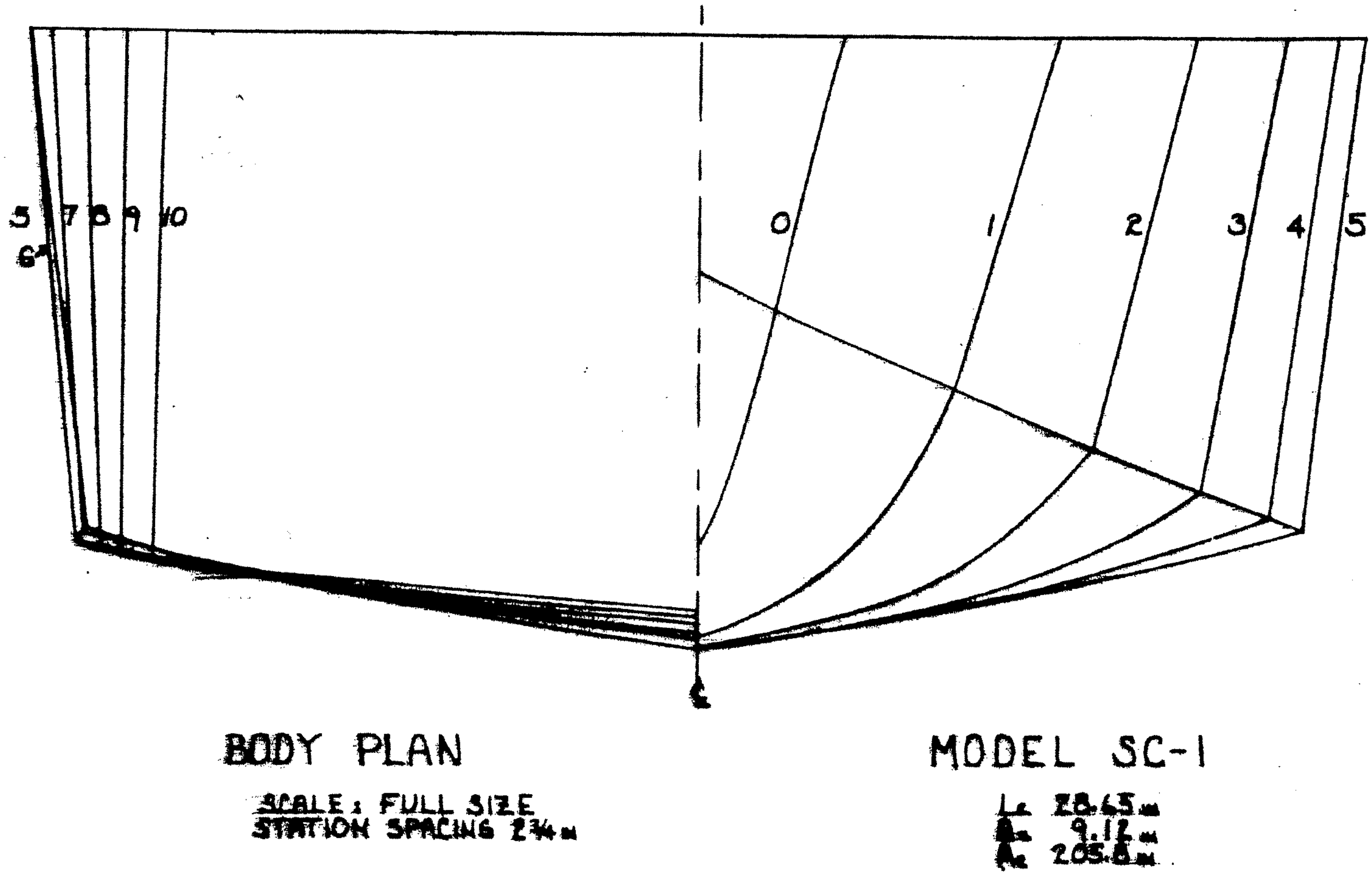
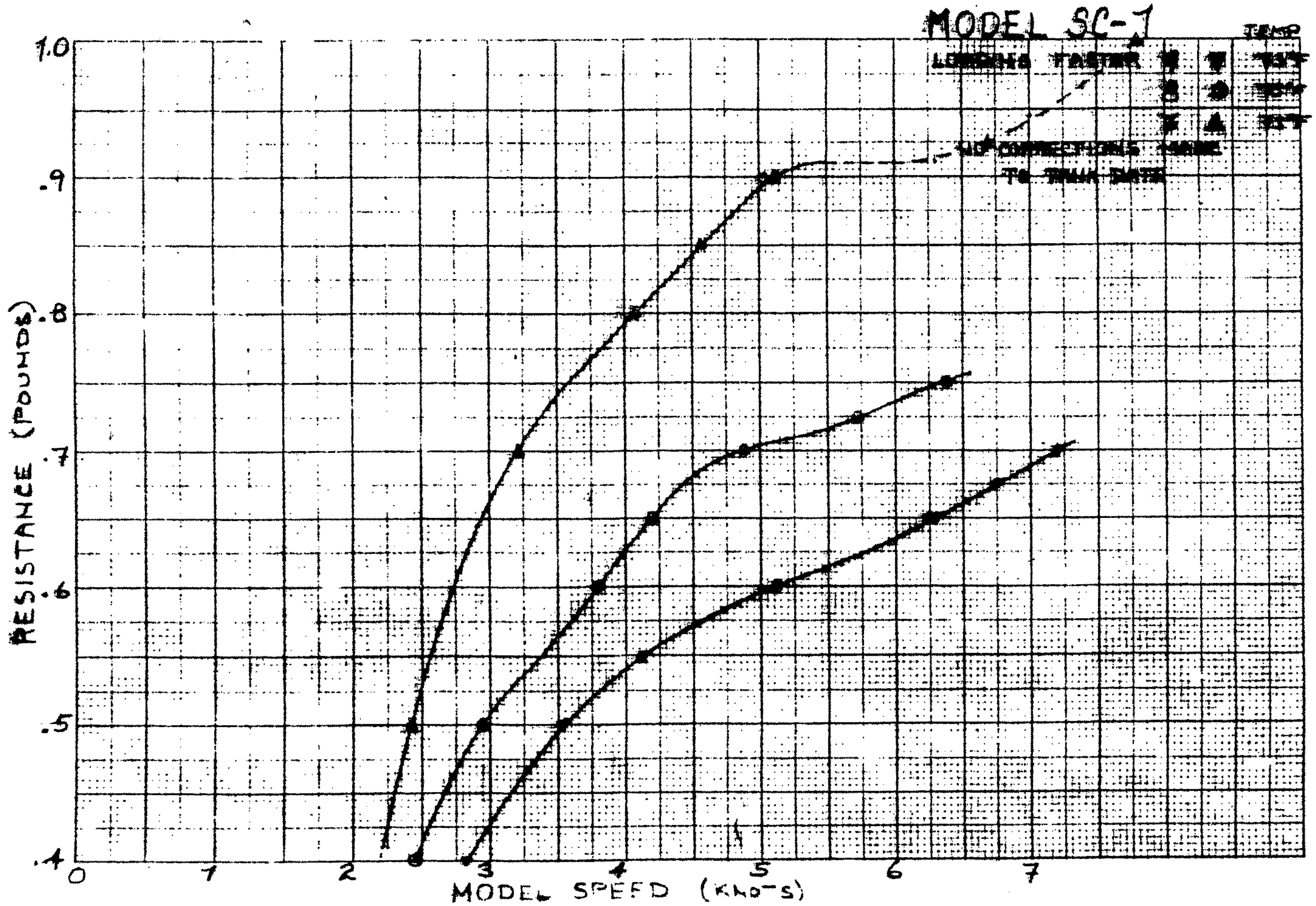

5
6
7
8
9
10
0
1
2
3
4
5
BODY PLAN
SCALE: FULL SIZE
STATION SPACING 2¾ in
MODEL SC-1

Fig. III

STILL WATER RESISTANCE



Loading Factor = $\frac{A_c}{\nabla^{2/3}}$ A_c = projected area bounded by chine and transom - plan view - ft^2